



The Radio Amateur Satellite Corporation

A demonstration of MAREA--the Mars-lander ARISS Robotics Exploration Activity

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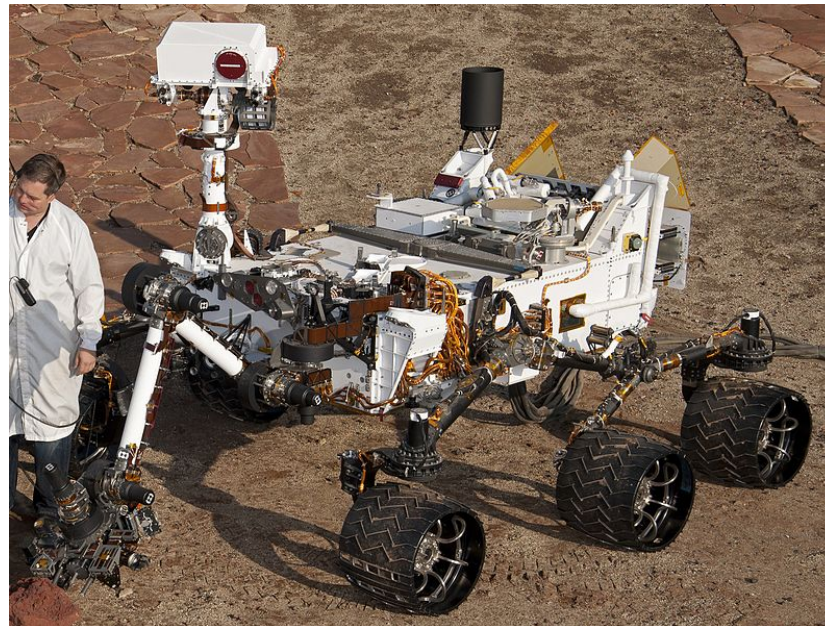
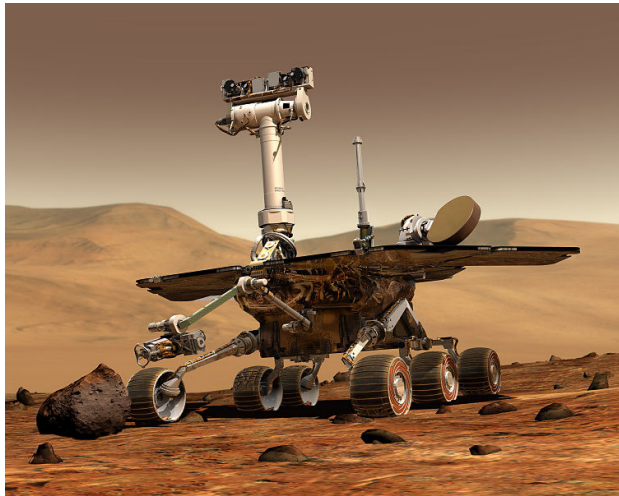
Acknowledgements:

Mark Spencer, WA8SME
Director ARRL Education & Technology
Program

And

Recently formed Educational Partnership
between AMSAT and ARRL, including
NASA

Recognize these?



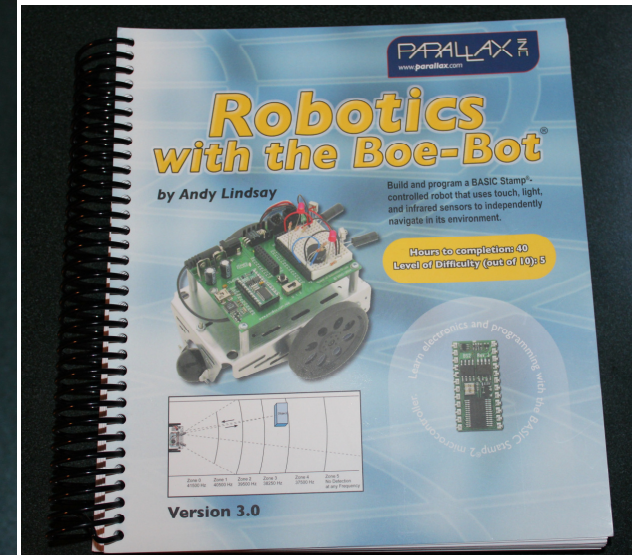
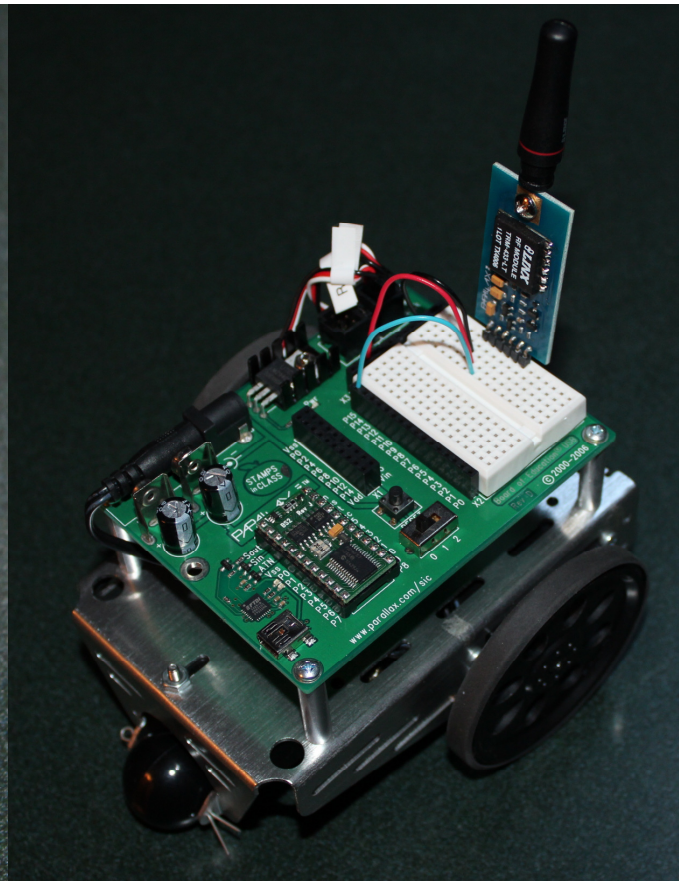
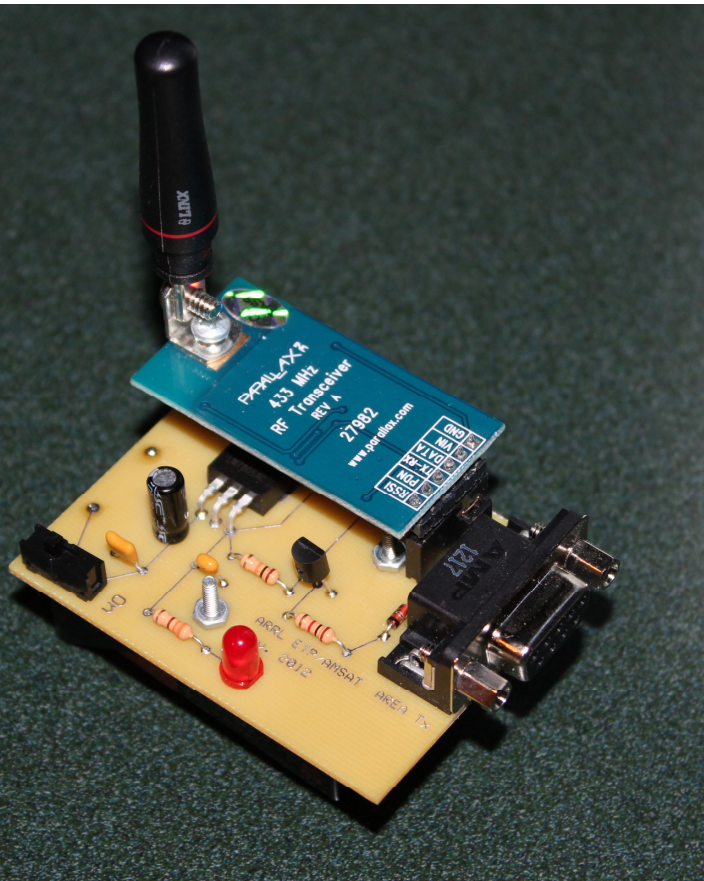


<http://www.space.com/17220-mars-rover-curiosity-martian-driving.html>

- By Mike Wall / Space.com/ August 22, 2012, 9:31 AM
- **Curiosity: How do you drive a \$2.5 billion Mars rover?**
(SPACE.com) NASA's [Mars rover Curiosity](#) is set to make its first test drive Wednesday (Aug. 22), then head out toward a spot called Glenelg in the coming days. Curiosity's drivers will guide the six-wheeled robot on the 1,300-foot (400-meter) trek to Glenelg -- not with a joystick, but via commands uploaded on a daily basis.
- "The rover may be powered off while we're actually doing our planning, and so we'll have eight or more hours to do our sequencing," said Jeff Biesiadecki of NASA's [Jet Propulsion Laboratory](#) in Pasadena, Calif. "Then we'll send up a command load to the rover and tell it step-by-step what it needs to do."

Other Educational Activities

- MAREA- the Mars-lander ARISS Robotics Exploration Activity





Other Educational Activities

- MAREA- the Mars-lander ARISS Robotics Exploration Activity
 - » Parallax BS2 based BOE-BOT, local RF link
 - » Simulates transmission/reception of ground station commands through space to control rover vehicle
 - » Command (text) from ground station->packet digipeat through ARISS on ISS->receive on ground station->local RF link sends command to Rover->movement executed
 - » Local testing/experimentation easy with only loopback audio cable (soundcard out->mic in)

Other Educational Activities

- MAREA- the Mars-lander ARISS Robotics Exploration
- Live demo via ARISS on ISS!





To fully participate in MAREA, schools will need the following resources:

- Basic robot system.
 - » Boe-Bot®, Parallax part number 910-90010 (serial version with USB converter): \$159.00
 - » Local UHF computer to Bot transceiver: \$130.00
 - » UISS packet software package: Free



To fully participate in MAREA, schools will need the following resources:

- Amateur Radio station configured for packet operation
 - » VHF Amateur Radio mobile transceiver (typical 50 watt transceiver): \$200.00
 - » DC power supply (10 amps): \$125.00
 - » Radio to computer sound card interface (SCI-6): \$25.00
 - » Coax and connectors (100 feet): \$100.00
 - » Homebrew turn style like antenna constructed by students or local amateur radio club : \$50.00 [if commercial egg beater like antenna \$225.00]
 - » Amateur Radio APRS data link network: free
 - » Amateur Radio Technician license: \$15 exam fee



Software needed for operations:

- AGW Packet Engine

- » Free soundcard packet software with KISS mode
- » (Can use hardware TNC if desired)
- » Use for receiving and transmitting 1200 AFSK packet
- » <http://www.sv2agw.com/ham/agwpe.htm>

- UISS

- » A free windows packet program that cooperates with AGW Packet Engine
- » Transmits/receives packets, including APRS
- » Can beacon locations, etc.
- » <http://users.belgacom.net/hamradio/uiss.htm>



Software needed for operations:

- AGWPE Serial Loopback program
 - » Loops KISS data to serial port and local RF link
 - » Effectively, it's a "KISS com port emulator/splitter"
 - » <http://www.pearsoncomputing.net/freeware.php>
 - » Free for amateur radio use (just register)

- Parallax PBASIC 2.5
 - » Used to edit/enter/upload Basic STAMP II code from PC to MAREA Boe-Bot
 - » <http://www.parallax.com>
 - » Free



Software needed for operations:

So how does it work?

- 1) Use AGWPE to decode received **audio** from rig
- 2) Use UISS to decode received **packets**
- 3) Use AGWPE Serial Loopback to copy packets to serial port where local RF transmitter is attached
- 4) **Local RF transmitter** “relays” command to MAREA robot
- 5) MAREA robot receives command via **local RF receiver** and executes movement


```
' {$STAMP BS2}
```

```
' {$PBASIC 2.5}
```

```
cmd VAR Byte(20)
```

```
counter1 VAR Byte
```

```
counter VAR Word
```

```
degrees VAR Word
```

```
cmd(19)=0
```

```
DO
```

```
SERIN 15, 813,[WAIT ("MAREA") ]
```

```
SERIN 15, 813, [STR cmd\20"E"]
```

```
FOR counter1 = 0 TO 20 STEP 4
```

```
  SELECT cmd(counter1)
```

```
    CASE "R"
```

```
      GOSUB right
```

```
    CASE "L"
```

```
      GOSUB left
```

```
    CASE "F"
```

```
      GOSUB forward
```

```
    CASE "D"
```



So how can MAREA be used in education?

Core Science Concepts Accessible via MAREA Technology

- Practices for K-12 Science Classrooms
- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information



So how can MAREA be used in education?

Core ideas in the life sciences

LS1: From molecules to organisms: structures and processes

LS1.D: Information processing

Core ideas in Earth and space sciences

EES1: earth's place in the universe

EES1.A: The universe and its stars

EES1.B: Earth and the solar system

Core ideas in engineering, technology, and applications of science

ETS1: Engineering design

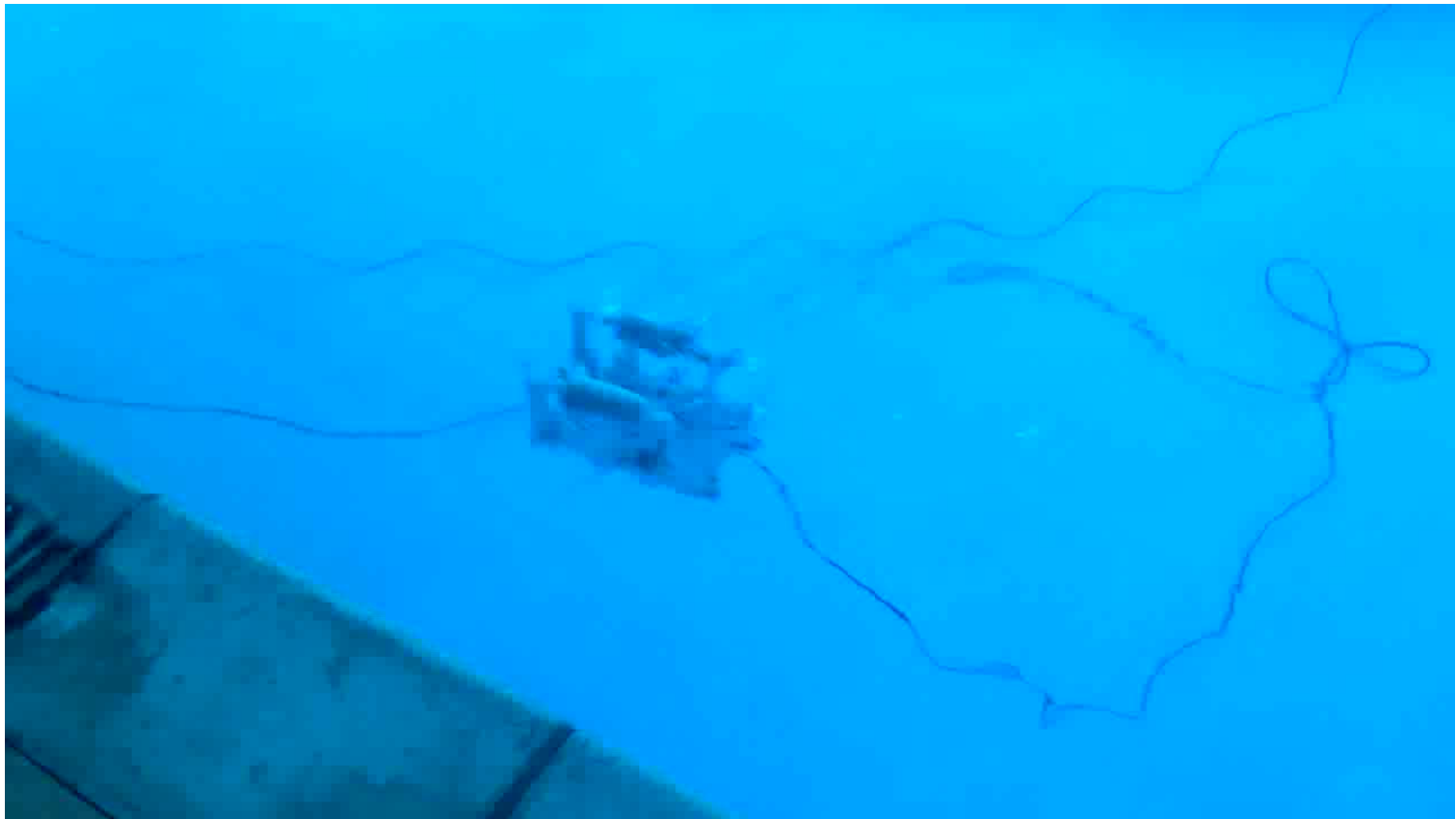
ETS1.A: Defining and delimitating an engineering problem

ETS1.B: Developing possible solutions

ETS1.C: Optimizing the design solution

So how about an underwater version?

- SeaPerch





Other AMSAT Items



- Contact me: Mark Hammond, N8MH@amsat.org